

EFFECT OF STORAGE ATMOSPHERE AND TEMPERATURE ON CORE FLUSH INCIDENCE IN GRANNY SMITH APPLES

Core flush occurs as a discolouration of the core tissue of cool-stored apples, varying from a faint pink colour in mild cases to a dark brown colour in severe cases. It is discussed by Carne (1948) in Australian grown apples, where it is stated to be a form of senescent breakdown of over-stored apples. In experiments carried out in Queensland prior to 1961 with controlled atmosphere storage of the Granny Smith variety, its incidence has been slight, and towards the end of the storage period it has been present in all treatments to the same extent. In experiments with this variety in 1961, Stevenson (1962) found core flush to be extremely severe. In that year the severity of the disorder was affected by both storage atmosphere and temperature and these investigations were carried out in 1962 to study further the effect of these factors on the incidence of the disorder.

Methods and Materials

Fruit for the experiment was obtained from an orchard on the Granite Belt, surrounding Stanthorpe on three separate occasions, viz. March 21, 1962 (first pick—M1), April 4, 1962 (second pick—M2), and April 18, 1962 (third pick—M3).

After picking, the fruit was transported to Brisbane by motor vehicle, when it was dipped in a 2,000-p.p.m. emulsion of ethoxyquin to control superficial scald. Samples of the dipped fruit, consisting of 30 apples, were held at 32°F, 34°F, and 36°F in gas-tight glass vessels. Atmospheres were maintained by passing small quantities of compressed air, diluted with nitrogen, into the vessels by means of capillary type manometric flow-meters. The atmospheres used were 5 per cent. oxygen; 7.5 per cent. oxygen plus 5 per cent. carbon dioxide; 7.5 per cent. oxygen plus 7.5 per cent. carbon dioxide; 10 per cent. oxygen plus 2.5 per cent. carbon dioxide; and normal storage atmospheres.

Initially it was proposed to maintain the oxygen concentration of all atmospheres constant at 5 per cent., with varying concentrations of carbon dioxide, but it soon became apparent that because of the method of obtaining the atmospheres this could not be done. For this reason atmospheres which would remain constant were used.

The experimental containers were opened on September 26, 1962 (Removal 1); October 26, 1962 (Removal 2); and November 26, 1962 (Removal 3); and 10 fruit removed. The fruit was held at 70°F for seven days, cut and core flush incidence assessed. Assessment was made by rating the severity of the disorder into absent, slight, medium, and severe, and the figures 0, 1, 2, and 4 assigned in that order. The weighted core flush rating was reduced by expressing the recorded incidence as a percentage of the maximum amount of core flush possible.

Results and Discussion

The results are summarized in Table 1. Incidence of core flush was significantly affected by atmosphere, storage temperature and length of the storage period, but time of picking had no effect. There was no significant difference between the two atmospheres containing 7.5 per cent. oxygen even though their carbon dioxide content was different. Fruit from both these atmospheres, however, was more severely affected than that from normal storage atmospheres, which in turn was more severely affected than that held in either 5 per cent. oxygen or 10 per cent. oxygen plus 2.5 per cent. carbon dioxide. Core flush incidence increased as storage temperature was decreased and with increase in length of the storage period.

TABLE 1
WEIGHTED CORE FLUSH IN GRANNY SMITH APPLES AFTER REMOVAL FROM STORAGE

—	5% O ₂	7.5% O ₂ + 5% CO ₂	7.5% O ₂ + 7.5% CO ₂	10% O ₂ + 2.5% CO ₂	Normal Storage
Removal 1	12.5	63.0	53.9	11.1	34.2
Removal 2	15.6	66.4	82.2	14.7	28.3
Removal 3	20.3	69.9	78.3	15.6	37.2
M1	21.4	41.0	75.0	13.3	41.1
M2	14.2	70.3	58.0	13.6	34.7
M3	12.8	88.0	81.4	14.4	23.9
32°F	17.2	94.0	96.1	24.2	23.9
34°F	17.2	69.4	67.8	9.2	36.7
36°F	13.9	35.8	50.6	8.1	39.2

7.5% oxygen plus 5% carbon dioxide; 7.5% oxygen plus 7.5% carbon dioxide significantly greater than Normal storage (1% level).

Normal storage significantly greater than 5% oxygen; 10% oxygen plus 2.5% carbon dioxide (1% level).

32°F significantly greater than 34°F (1% level).

34°F significantly greater than 36°F (1% level).

Removal 3 significantly greater than Removal 1 (1% level).

Removal 2 significantly greater than Removal 1 (5% level).

These results confirm the observations of Stevenson (1962) with respect to storage atmosphere and temperature. It is not possible to consider the separate effect of oxygen and carbon dioxide concentrations in the storage atmospheres used in the experiment, but this factor appears worthy of further study since the results suggest that a relationship between high carbon dioxide levels and core flush incidence may exist.

REFERENCES

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